Resource Action: EWG-61	**Task Force Recommendation Category:** 2

ENHANCE RIPARIAN VEGETATION WITHIN THE OROVILLE WILDLIFE AREA

Description of Potential Resource Action:

This Resource Action proposes to enhance or create riparian vegetation along the Feather River and adjacent areas within the Oroville Wildlife Area (OWA). This would be accomplished by 1) developing a hydrologic flow regime that would support natural regeneration of riparian vegetation and/or 2) actively planting riparian trees and shrubs along shorelines, side channels, and other appropriate areas along the Feather River and within the OWA.

The following resource actions are either similar to or directly related to the proposed measure:

- EWG 51 – enhance riparian vegetation along the low flow channel of the Feather River
- EWG 66 – enhance riparian vegetation along the high flow section of the Feather River
- EWG 67 – enhance riparian vegetation and wetlands around the Thermalito Afterbay
- EWG 68B – enhance or create riparian vegetation and/or other native vegetation within the drawdown/fluctuation zone of Lake Oroville
- EWG 79 – enhance riparian habitat in the Oroville Wildlife Area for special status species habitat

Invasive plant species with a restoration component:

- EWG 70 – control noxious plants in low flow section of Feather River
- EWG 74 – control noxious plants in Project area

Fisheries improvements:

- EWG 16B – restore rearing habitat for juvenile salmonid fish species
- EWG 17 and 51 – enhance riparian vegetation to increase shading and habitat complexity
- EWG 89 - levee setbacks and increase floodplain accessibility
- EWG 99 – side channel enhancements

Nexus to Project:

Channel movement, geology, and hydrology are physical factors largely responsible for the development and maintenance of riparian forests along the Feather River. Many factors, including construction of the dam at Lake Oroville, historic land use activities (hydraulic mining), and regulation of stream flows have impacted these riparian ecosystems downstream of Oroville Dam.

Potential Environmental Benefits:

Riparian systems provide a number of important functions to both the aquatic and terrestrial ecosystems associated with them, including stream bank stabilization, temperature moderation by shading, stream structural diversity, and wildlife habitat. The diversity and density of wildlife species associated with these ecosystems is disproportionately high in comparison to other plant communities. A more structurally and species diverse riparian system in the OWA would enhance both fish and wildlife habitats as well as aesthetic qualities and help decrease invasions by noxious and invasive plant species.

Potential Constraints:

Riparian vegetation along the Feather River and in the OWA has been affected by a myriad of causes stemming from the disruption of natural geomorphic processes including historic hydraulic mining, historic and current land uses, flood control levees, flow regulation, and the presence of dams including Oroville Dam. The dams block sediment recruitment from the upstream basin; levees along the Feather River within and adjacent to the OWA have reduced the accessibility of the Feather River to its floodplain; the present channel is armored by large cobble and confined by piles of dredger tailings; and the alluvial soils in the OWA have been replaced with large cobble/dredger tailings.

A number of potential constraints are associated with the enhancement of riparian vegetation in the Oroville Wildlife Area:

- To increase riparian recruitment through modification of the hydrologic regime involves not only increased stream flows at the expense of hydropower generation and water supply, but there must also be suitable substrate available to create surfaces suitable for seedling recruitment and germination.
- Increasing the frequency and/or magnitude of flows will also affect downstream properties.
- Levees constrain river from accessing floodplain
- Any work within the bed, bank, and floodplain will involve permitting from a number of agencies (CDFG, ACOE, SWQCB, etc.)

- Sites suitable for restoration may contain important cultural resources

Existing Conditions in the Proposed Resource Action Implementation Area:

The Feather River from River Mile (RM) 54.2 to RM 64.5 is contiguous with the OWA and extends from the southern edge of the Oroville Facilities Project boundary to Hwy 162 (Figure 1). The Thermalito Afterbay Outlet enters the Feather River at RM 59.0. Above the TA Outlet, the low flow reach of the Feather River is outside the Project boundary upstream from RM 60.2. Approximately 2,295 acres of the OWA occur above the TA Outlet. The portion of the Feather River below the TA Outlet (high-flow reach) is both within the Project boundary and the OWA. Approximately 3,290 acres of the OWA occur below the TA Outlet. Both reaches are characterized by coarse dredge tailings composing both the bed and banks. Point bars and mid-channel islands are common, but most of these depositional features are armored by cobbles and boulders. Levees severely constrict the floodplain along most of both reaches. The piles of dredger tailing have replaced the natural floodplain soils and have increased floodplain elevation along the river. Overflow weirs into the OWA occur in at least four places.

Approximately 615 acres of barren gravel/cobble piles exist within the OWA, almost all of which occurs below the TA Outlet. The free draining nature of these cobbles preclude riparian vegetation establishment. Figure 2 and 3 show areas of sparse vegetation and dredge tailings in the Project area below the Thermalito Outlet and at the southern end of the Project area. Within most of the OWA, riparian vegetation is sparse, occurring primarily in narrow bands along the river channel and in fragmented patches around ponds and swales that have been excavated in the dredge tailings (Figure 4). These low-lying features are typically connected to a perennial or seasonal groundwater supply and support a variety of sparsely vegetated wetland/riparian vegetation types. Non-native invasive species such as tree of heaven, giant reed, scarlet wisteria, purple loosestrife, and a number of naturalized landscape trees occur throughout the OWA and have replaced native riparian species and habitats.

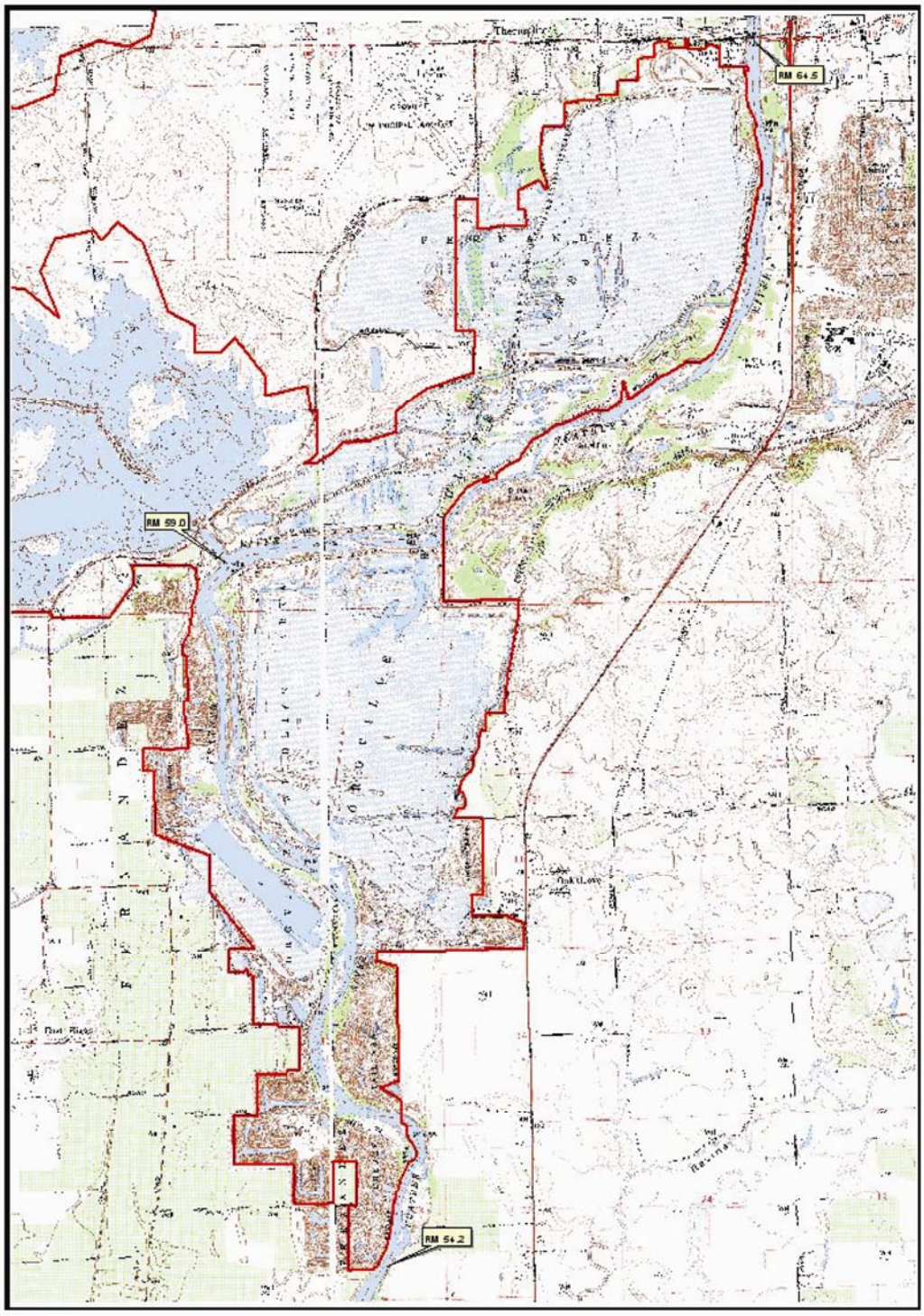

Figure 1. Overview map of Feather River and Oroville Wildlife Area.

Figure 2. Feather River and Oroville Wildlife Area below Thermalito Outlet.

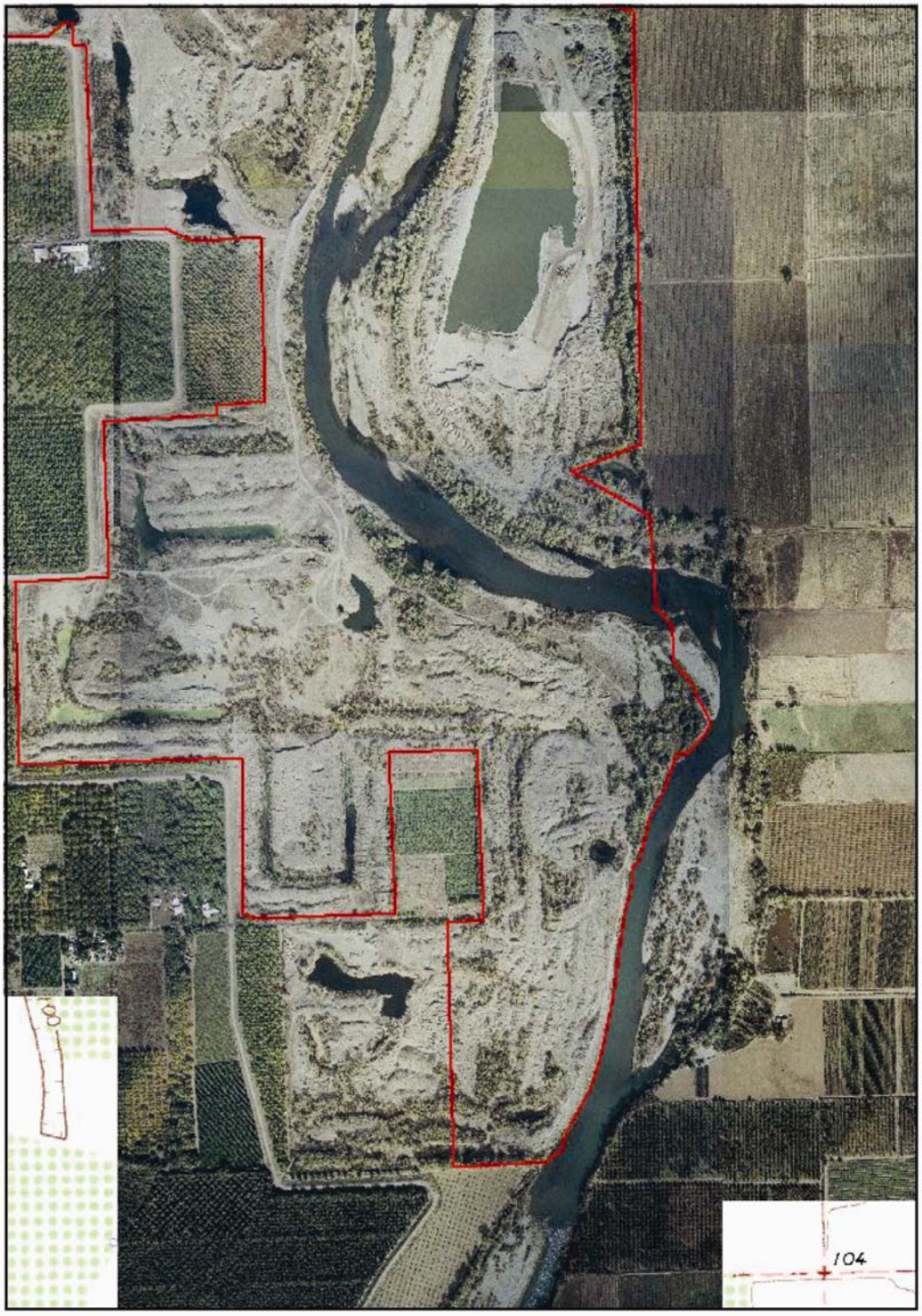

Figure 3. Feather River and Oroville Wildlife Area at south end of Project area.

Figure 4. Sparse Fremont cottonwoods and willows along dredge tailing ponds and Feather River.

Design Considerations and Evaluation:

This Resource Action addresses riparian enhancement either by hydrologic regime modification, planting of riparian species, or both. Under natural conditions, riparian pioneer species, such as cottonwoods and willows, colonize bare (scoured), moist alluvial surfaces, typically present after high flow events. During high flow events, overflow of the bankfull stage connects the floodplains with the main channel. As the flood waters recede; the barren, moist soils are germination sites for early successsional species such as cottonwoods. These species generally release their seeds in late spring (April – June) when historic high flows would most likely be receding. As the seeds germinate on these moist surfaces, the rate of water-level decline must not exceed the seedling root growth rate or the seedlings will desiccate and die.

During field studies along the Merced, Sacramento, and Feather Rivers, it has been observed that floodplain depressions, high flow channels, and other off-channel sites that historically received overbank flooding and sediment deposition were more likely

to provide conditions conducive to successful establishment under regulated flow regimes.

Riparian enhancement by modification of the hydrologic regime during the April through June period would best be considered in combination with a number of other Resource Actions involving geomorphic modifications, levee setbacks, side channel enhancements, noxious weed management, and active riparian species plantings. For example, although flow enhancement and an appropriate ramping down rate at the right time of year might provide adequate moisture for germination, the armoring by large cobble/dredge tailings that is common throughout the OWA would not provide suitable substrate for seed germination and seedling growth.

Large blocks of riparian vegetation are most desirable for both wildlife habitat and riparian species diversity. A few areas identified along the Feather River may benefit from flow enhancement when coupled with an appropriate ramping down rate. For example, the vegetation on the right bank at RM 55 and on the left bank at ~RM 54.5 may be expanded using a combination of increased flows, appropriate ramping down rates, and active plantings of riparian species, both within the channel, low lying areas within the gravel bars, and within excavated areas in the adjacent dredge tailings of the OWA.

Within the dredge tailing of the OWA, most of the riparian trees and shrubs occur in low-lying swales and ponds. These support widely scattered, sparse riparian vegetation. These areas could potentially be expanded by further dredging and removing large cobble down to an elevation where ground water would be available year round for riparian species. Side channels or old canals could be revegetated with riparian species. Much of the OWA has invasive species that are currently expanding their range and heavily impact the riparian vegetation. Removal of these species (EWG 70, 73, and 74), coupled with active revegetation with appropriate species would further enhance riparian vegetation.

Synergism and Conflicts:

The goal of this Resource Action is to increase riparian vegetation and to provide a functional riparian and floodplain corridor along the Feather River in the OWA. This is compatible and should be considered in combination with a number of other Resource Actions involving geomorphic modifications, levee setbacks, side channel enhancements, noxious weed management, etc.

Conflicts exist between the demands for water for hydropower generation and water supply and the timing of releases for riparian species recruitment coupled with a ramping down rate equal to the growth of seedling/sapling root growth.

Uncertainties:

A number of uncertainties exist with this measure. There are two components to this Resource Action. First, if a modified hydrologic regime is to be used to increase riparian vegetation, this Resource Action should be a component of an overall strategy for improving conditions and restoring a functional riparian and floodplain corridor along this reach of the Feather River. This will require a complex engineering and environmental design analysis. A major uncertainty for modification of streamflow only for restoring riparian vegetation would be what level of success could be achieved and to determine the level of stream flow required that will move the large cobble necessary to expose suitable surfaces for seedling germination.

Cost Estimate:

Costs for this Resource Actions would vary greatly depending upon the action and/or combination of actions. Planting of riparian species and site preparation alone are estimated at $3,000 to $8,000 per acre.

The cost of flow modifications has not been quantified. Such flows should mimic natural high flow events with an appropriate ramp down rate. Under current operations, the ramp down rate after high flow events is moderately fast to maximize the water storage in Lake Oroville. Providing such flows for riparian recruitment would probably be at the expense of power generation and water supply to downstream users.

Recommendations:

Riparian enhancement measures should be considered for the OWA. At present, riparian habitats in the OWA have low species and structural diversity; are widely scattered; and are heavily invaded by non-native invasive species. This measure should be considered in combination with other Resource Actions that aim to improve the functional riparian system.

Although a comprehensive riparian enhancement program for the entire Feather River corridor would be preferable, the scope of such an effort would be beyond the scope of the Oroville Relicensing boundary and DWR's obligation. However, a number of small-scale actions could be combined to enhance a variety of environmental resources. Side channel improvements, pond excavations, levee setbacks, floodplain connectivity, weed management, etc. with a riparian planting component would enhance riparian habitats within the OWA.